

as a subspecies or variety of *S. retusa*, which arose under the hard climatic conditions of the high mountains. Rechinger (1938) first proposed that *S. retusa* and *S. kitaibeliana* could be polyploid descendants of *S. serpyllifolia*. Recent chromosome counts made by several authors seem to confirm this but suggest that the situation might even be more complex (Table 1).

At first sight, there doesn't seem to be a simple coherence between species and polyploidy level. In each taxon we find two or even three different chromosome numbers. This might be because the species are primarily defined by their morphological (in this case quantitative) characters and not necessarily according to their sterility barriers (e.g. different polyploidy levels) to other species. Quantitative features may overlap between neighbouring polyploidy levels from genetic variability and response to environmental influences. It is concluded that both *S. retusa* and *S. kitaibeliana* do not contain the diploid level.

The situation becomes somewhat clearer when considering the geographical distribution of the polyploidy levels. The diploid *S. serpyllifolia* appears to be restricted to the central part of the Alps. Tetraploid plants of all three species are reported either from the Tatra mountains (Poland and C.S.F.R.) or at least from authors of these countries. Plants of the highest polyploidy levels ($2n = 114 \dots 152$) were found in the Alps, the Tatra- and the Pirin-mountains (Bulgaria). They often show more or less serious irregularities with losses of chromosomes during meiosis (Büchler 1986). Some of them were found to be aneuploid, with an outset point at $2n = 152$. Others, like the hybrids of *S. retusa* with *S. nigricans* Sm. and *S. bicolor* Ehrh. started at $2n = 7 \times 133$ (resulting from a combination of hexaploid and octoploid parents). Descendants of these plants may have chromosome numbers floating between $2n = 114 \dots 152$, in the long-term probably with a downward trend.

References

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Salix acmophylla Boiss. – another *Salix* species with two loose bud scales?

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In most willow species axillary buds have a single bud scale formed by the fusion of two prophylls on both abaxial and adaxial side (see Figs 1 and 2). The first two cataphylls appear usually in the transversal plain while the following pass over in the spiral fashion of about 2/5 divergence (Kimura & Sugaya 1965).

In the section *Humboldtianae* the two prophylls grow together only on the abaxial side and the first cataphyll is situated on the adaxial side. Chmelař (1978) found that *S. tetrasperma* Roxb., is an exception, the first cataphyll taking the function of a supplementary inner bud scale. This gave him evidence of an extraordinary position of this species from the phylogenetic point of view, placing it at the outset of a hypothetical development line in the genus *Salix*.

New studies in the *Salix* collections of H. Oberli (CH-Wattwil) and W. Büchler (CH-Wetzikon) revealed the possible existence of another species, viz. *Salix acmophylla* Boiss., with a similar character. The inner scale is placed opposite to the outer scale, embracing the bud almost entirely. Unlike *S. tetrasperma*, where the lateral buds are placed inside the inner scale (Chmelař 1978), in *S. acmophylla* they are situated between the inner and the outer scale. The inner scale stretches slightly after expulsion of the sprout but dries out and soon after falls off. Other members of

Table 1. Chromosome numbers

<i>S. serpyllifolia</i> Scop.			
$2n = 2 \times = 38$	Engadin, Switzerland	♀	Büchler, 1985
$2n = 2 \times = 38$	Kt. Glarus, Switzerland	♀	Büchler, 1985
$2n = 2 \times = 38$	Kt. Wallis, Switzerland	♂	Büchler, 1986
	(3 plants)	♀	
$2n = 2 \times = 38$	Dolomites, Italy	♂	Büchler, 1986
$2n = 2 \times = 38$	Friaul, Italy	?	Büchler, unpubl.
$2n = 4 \times = 76$	origin not given	♀	Váchová, 1976
			(in Chmelař 1979)
$2n = 8 \times = 152$	origin not given	♀	Váchová, 1976
			(in Chmelař 1979)
<i>S. retusa</i> L.			
$2n = 4 \times = 76$	Tatra Mts, C.S.F.R.	♂	Váchová, 1976
			(in Chmelař 1979)
$2n = 4 \times = 76$	Tatra Mts, Poland	?	Izmailow, 1980
$2n = 6 \times = 114$	Alps	?	Mattik, 1950
			(in Löve & Löve 1961)
$2n = 6 \times \approx 114$	Pirin mountains, Bulgaria	♀	Büchler, unpubl.
$2n = 6 \times \approx 114$	Kt. Appenzell, Switzerland	♂	Büchler, 1985
$2n = 8 \times \approx 148^*$	Kt. Appenzell, Switzerland	♂	Büchler, 1986
$2n = 8 \times \approx 152$	Kt. Appenzell, Switzerland	♂	Büchler, 1986
$2n = 8 \times \approx 152$	Kt. Wallis, Switzerland	♂	Büchler, unpubl.
$2n \approx 7 \dots 8 \times \approx 140^*$	garden form	♂	Büchler, unpubl.
<i>S. kitaibeliana</i> Willd.			
$2n = 4 \times = 76$	Tatra Mts, C.S.F.R.	♂	Váchová, 1976
			(in Chmelař 1979)
$2n = 4 \times = 76$	Tatra Mts, Poland	?	Izmailow, 1980
$2n = 8 \times \approx 152^*$	eastern Tatra Mts, C.S.F.R.	♂	Büchler, 1985
$2n = 8 \times \approx 152^*$	Tatra Mts, Poland	♀	Büchler, unpubl.
<i>S. nigricans</i> Smith \times <i>retusa</i> L. (<i>S. cotteti</i>)			
$2n = 8 \times \approx 152^*$	garden form	♂	Büchler, unpubl.
<i>S. bicolor</i> Willd. \times <i>retusa</i> L.			
$2n \approx 7 \times \approx 130^*$	Kt. Fribourg, Switzerland	♂	Büchler, unpubl.

* possibly aneuploid

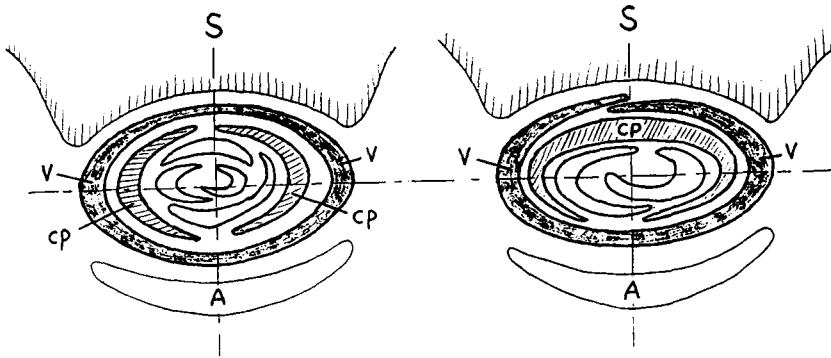


Figure 1. Bud diagrams. Left: principle diagram of most *Salix* species except Humboldtianae. Right: principle diagram of the Humboldtianae species. (S) part of stem; (A) part of axillant leaf; (V) prophylls and (cp) cataphylls.

the *Humboldtianae* show on principle the same bud diagram but the prophylls (outer bud scale) and the first cataphyll may develop differently after expulsion of the sprout. In *S. humboldtiana* Willd., probably the most retarded willow species, the

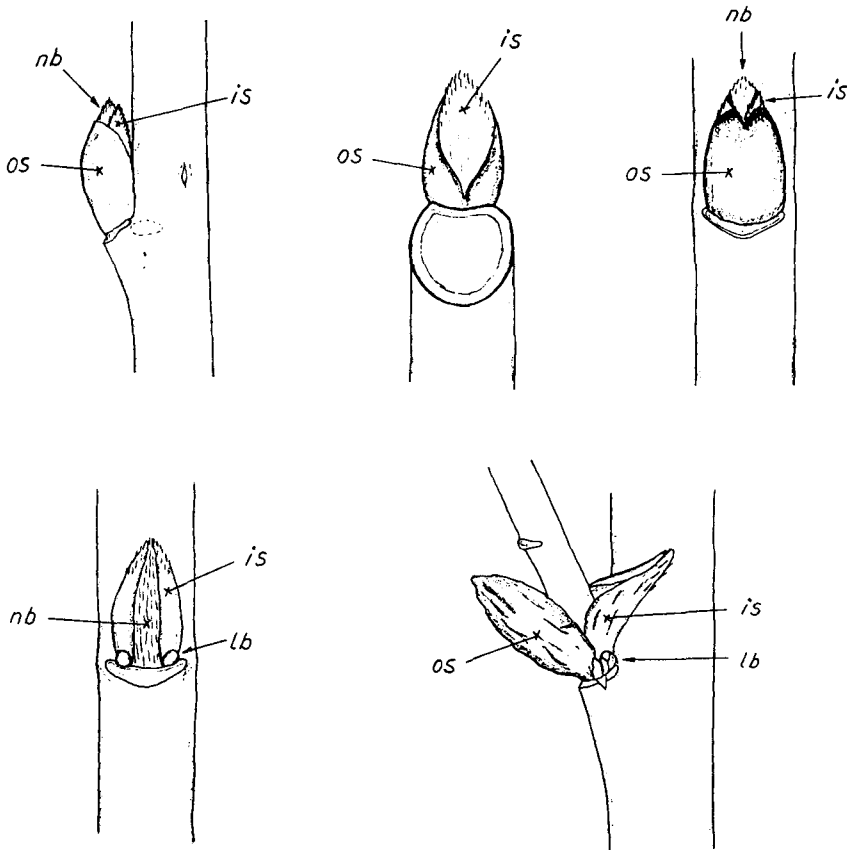


Figure 2. Outer scale removed. (os) Outer scale: leathery, slightly red-brown, bald. (is) Inner scale: leathery, slightly rosy, hairy on the upper end, growing only slightly after expulsion of sprout, drying out. (lb) Lateral buds: placed between inner and outer scales. (nb) Naked bud.

outer bud scale stretches considerably after expulsion of the sprout. The first cataphyll is lifted up by the sprout and remains green for some time.

The observations on *S. acmophylla* were made on a single plant received from the Botanic Garden of Cairo. Studies should be extended to other specimens from different natural habitats and to other species of the *Humboldtianae* e.g. *S. subserrata* Willd.

References

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Resistance of *Salix viminalis* to gall-midge attack

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We are interested in understanding why certain clones of basket willow *Salix viminalis* L. are resistant to attack by the gall-midge *Rabdophaga marginemtorquens* Bremi. That this resistance is of a genetic nature is clear but which host-plant characteristics are responsible are unknown.

Results from field studies show differences in density of galls per shoot on the resistant and susceptible willow types. This resistance is affected neither by nutrient regime nor by earlier midge attack. Laboratory studies reveal that females do not discriminate between the two plant types during oviposition.

Hypotheses have been based on observations of extremely high early larval mortality rates on the resistant clones. Two explanations for this are that the larvae do not succeed in initiating feeding on the resistant clones, or commence the larvae feeding but die soon thereafter. Given that larvae do not initiate feeding we can see three possible mechanisms for this: larvae are unable to break through the cell wall of the leaf, resistant clones lack certain feeding stimulants, or they contain toxins. When larvae die soon after they commence feeding, explanations could lie in either that the plant responds actively to the midge attack with an induced defence or that the food is unsuitable for the larvae, a so called constitutive defence.